

CLAIM OR CLAIMS

WHAT IS CLAIMED IS:

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5 1. A method of generating a normalized bitmap representation of the shape of a visual object in an image comprising the steps of:

segmenting the image to generate a segmentation map of visual objects;
identifying samples from the segmentation map belonging to a visual object of interest;

10 identifying the largest connected blob to form an un-normalized bitmap; and

normalizing the un-normalized bitmap to form the normalized bitmap representation.

15 2. The method as recited in claim 1 further comprising the step of searching a database of images, each image having associated visual objects with normalized bitmap representations, in response to a query specifying a desired normalized bitmap representation to identify a plurality of visual objects having normalized bitmap representations that closely match the desired normalized bitmap representation.

20 3. The method as recited in claim 1 wherein the normalizing step comprises the steps of:

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estimating a mean and covariance for each valid sample in the un-normalized bitmap;

computing a principal direction for the un-normalized bitmap based upon the mean and covariance as eigenvectors of a covariance matrix; and

5 back projecting the un-normalized bitmap as a function of the mean and eigenvectors to normalize the un-normalized bitmap for translation, rotation and scale so that after normalization the normalized bitmap representation has a standard height and is oriented such that the principal direction is along a vertical direction.

10 4. The method as recited in claim 2 wherein the searching step comprises the steps of:

providing a query bitmap seeking similarly shaped visual objects from the database;

15 normalizing the query bitmap;
obtaining various mirror versions of the normalized query bitmap;
for each normalized bitmap representation in the database compute a mismatch value with the normalized query bitmap; and
identifying the visual objects having normalized bitmap representations with low mismatch values.

20 5. The method as recited in claim 2 wherein the searching step comprises the steps of:

providing a query bitmap to find visual objects in the database having a similar aspect ratio;

normalizing the query bitmap;

computing a query aspect ratio for the normalized query bitmap;

5 computing an aspect ratio for each normalized bitmap representation

in the database;

obtaining an absolute difference between the aspect ratios for each normalized bitmap representation and the query aspect ratio; and

identifying the visual objects where the absolute difference has low values.

6. The method as recited in claim 2 wherein the searching step comprises the steps of:

providing a query bitmap to find visual objects with a similar density of valid samples;

computing a query density of valid samples for the query bitmap;

computing a density for each normalized bitmap representation in the database;

obtaining an absolute difference between the density for each normalized bitmap representation and the query density; and

identifying the visual objects where the absolute difference is low.

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